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**ELECTRIC WASHING METHOD AND ITS APPARATUS**

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[There are no amendments to this patent.]

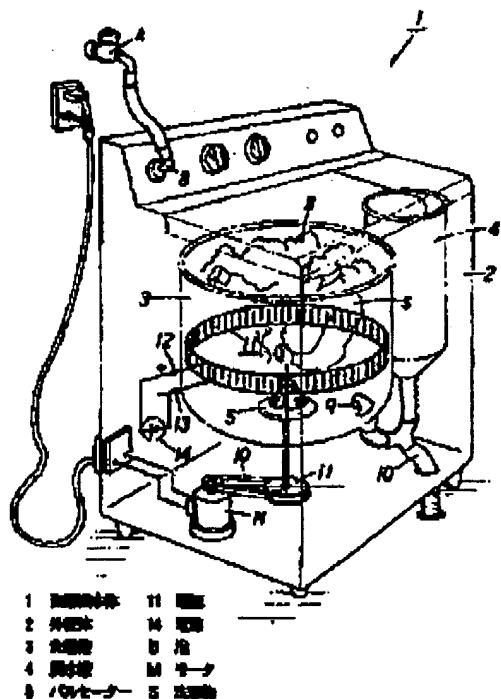
**Abstract**

**Constitution**

The present invention provides a new washing method as an auxiliary action of a conventional washing method or as an independent washing method or an apparatus and is characterized by the fact that wash water is electrolyzed by applying a direct-current voltage to the wash water into which the laundry S is dipped.

**Effect**

In the washing method or apparatus of the present invention, the washing effect is improved over the case where only a conventional washing method is applied, and the laundry S is not damaged. Therefore, with the introduction of the washing method of the present invention into conventional stirring type washing machines, the washing performance is improved, the washing time is shortened, and a milder stirring can be selected, so that the laundry is protected.



- Key:
- 1 Main body of washing machine
  - 2 External case
  - 3 Washing tank
  - 4 Dehydrating tank
  - 5 Pulsator
  - 11 Electrode
  - 14 Power source
  - B Bubble
  - M Motor
  - S Laundry

**Claims**

1. An electric washing method, characterized by the fact that wash water is electrolyzed by applying a direct-current voltage to the wash water into which the laundry is dipped.
2. An electric washing apparatus, characterized by being equipped with a washing tank; at least one pair of electrodes installed at positions below the water surface when water is put into the washing tank; and an electrical supply means to the electrodes.

**Detailed explanation of the invention**

[0001]

**Objective of the invention**

**Industrial application field**

The present invention pertains to a washing method for washing laundry such as clothes and its apparatus.

[0002]

**Background of the invention**

As conventional washing methods of washing machines for homes, there are basically three methods, the whirl type, stirring type, and drum type. However, in each of these washing methods, since washing is carried out by violently moving water and laundry through the rotation of a rotor, the laundry is more or less damaged, or the laundry is entangled.

[0003]

**Technical items to be developed**

In order to solve these problems, in the present invention, a new washing method or washing apparatus has been developed as an auxiliary action to conventional washing methods or as an independent washing method.

[0004]

**Constitution of the invention**

**Means to achieve the objective**

In other words, the electric washing method of a first invention of this application is characterized by the fact that wash water is electrolyzed by applying a direct-current voltage to the wash water into which the laundry is dipped.

[0005]

Also, the electric washing apparatus of a second invention of this application is characterized by being equipped with a washing tank; at least one pair of electrodes installed at positions below the water surface when water is put into the washing tank; and an electrical supply means to the electrodes. The above-mentioned objective is achieved by these inventions.

[0006]

#### Operation of the invention

In the present invention, oxygen and hydrogen bubbles generated by electrolysis collide with the laundry and mechanically remove stains. Also, active oxygen formed during electrolysis oxidizes the stain components or removes the stains by changing them into simple molecules. Furthermore, charged stains are drawn to electrodes and are electrically neutralized, so that they are not reattached, or if a detergent is used, calcium ions or magnesium ions that hinder the washing effect are electrically neutralized, so that this washing hindrance factor is cut off.

[0007]

#### Application examples

Next, the present invention will be explained based on application examples shown in figures. In Figure 1, the present invention is applied to a whirl type washing machine. In the figure, 1 is the main body of the washing machine. The main body 1 of the washing machine is a two-tank type washing machine in which a washing tank 3 and a dehydrating tank 4 are formed in an external case 2, and a pulsator 5 is provided to the lower part in the washing tank 3. The drive of a motor M installed at the bottom of the external case 2 is transmitted via a belt 10 and a pulley 11 to the pulsator 5, which is rotated and driven.

[0008]

Also, a water supply port 8 is formed at the upper sidewall of the washing tank 3 and leads to a faucet A, and a drainage port 9 is formed on the lower surface of the washing tank 3 and is connected to a drainage hose 10.

[0009]

Next, the characteristic structure of the present invention is explained. At the lower side of the inner side surface of the washing tank 3, a pair of electrodes 11 having + pole 12 and - pole 13 are installed in a band shape along the inner side surface. These + pole 12 and - pole 13, as shown in Figure 3, are respectively comb types, and the teeth of each comb overlap each other in an alternating fashion, so that the electrodes 11 are formed. The material constituting the

electrodes 11 may be nonmetals such as carbon in addition to metals such as titanium, platinum, silver, and aluminum. As its form, in addition to solid plates, the above-mentioned metal foil may be attached, plated, or vapor-deposited, or an electroconductive paint may be spread. Also, obviously, the electrodes 11 may be several pairs.

[0010]

Also, these electrodes 11 are connected to a power source 14 that is an electrical supply means outside the washing tank 3. The power source may be an external power source such as an outlet in a house, and in this case, the electrical supply means defined by Claim 2 corresponds to a wiring structure from the external power source to the electrodes. Also, the voltage of the power source is set at 30 V or less to prevent electric shock, and the voltage can be adjusted in accordance with the electric conductivity of the wash water and the formation state of the electrodes. Also, if 100 V for a house is employed as a power source, it is changed to a direct current, and the electricity is supplied to the electrodes 11 after lowering the voltage to 30 V or less.

[0011]

Also, these electrodes 11 may also be installed in a circular shape on the bottom face of the washing tank 3 as shown in Figures 4 and 5. In other words, the electrodes 11 may be installed at any position as long as they do not receive the resistance of water or do not damage the laundry and they are positioned below the water surface when water is placed in the washing tank 3. Furthermore, as the shape of the electrodes 11, for example, the + poles 12 and the - poles 13 can be installed as dots as shown in Figure 6(a), or the + poles 12 and the - poles 13 may also be installed as a grid as shown in Figure 6(b). Also, the electrodes 11 are preferably positioned in the washing tank 3 spaced as widely as possible in terms of good efficiency of the electrolysis.

[0012]

Also, in the washing machine of this application example, since the pulsator 5 produces a rotary water flow and the laundry S is electrically washed while stirring, protruded parts 15 made of a soft resin and thicker than the electrodes 11 may also be formed at the inner wall of the washing tank 3 as shown in Figure 7, for instance, to prevent damage to the laundry and the electrodes due to friction with the electrodes 11 during stirring of the laundry S. In addition, the electrodes 11 can be vertically moved in the washing tank 3, or the electrodes 11 can also be freely attached and detached so that maintenance in the washing tank 3 is convenient.

## [0013]

Next, as the wash water introduced into the washing tank 3, in terms of electric conductivity, since electrolytes at a fixed level are dissolved in ordinary city water, the city water may be applied as is or may be used by adding a detergent. However, in order to further raise the electric conductivity, an electrolyte such as sodium metasilicate may be dissolved to some degree in the wash water.

## [0014]

The electric washing apparatus of the present invention has the above constitution, and its operation state is explained below. First, similar to an ordinary washing machine, city water is supplied into the washing tank 3 from the water supply port 8, a detergent is added, the laundry S is added, and washing is started by driving the pulsator 5. Up to this point, the operation is the same as that of a conventional washing machine; however in the washing method of the present invention, electricity is supplied to the electrodes 11 by turning on the switch of the power source 14.

## [0015]

Thus, the wash water in the washing tank 3 is electrolyzed, and gases such as oxygen, hydrogen, and chlorine float as fine bubbles B in accordance with the components of the wash water, and the bubbles B collide with the laundry S, weaken the coupling between stains and the laundry S, and mechanically remove the stains. Also, the active oxygen formed by the electrolysis oxidizes the components of the stains or changes simple molecules, so that the stains are easily removed. At the same time, charged stains among the removed stains are drawn to the electrodes and electrically neutralized, so that they do not reattach. Also, when the city water is hard water, calcium ions, magnesium ions, etc., which hinder the washing performance of a detergent are electrically neutralized, so that this washing hindrance factor can be eliminated. In this manner, washing with good stain removal is realized, compared with an ordinary washing that simply uses a detergent.

## [0016]

Also, in the above application example, the present invention has been applied to a washing machine equipped with a pulsator; however the apparatus of the present invention does not necessarily require a stirrer such as a pulsator, and as the simplest apparatus of the present invention, a constitution in which the electrodes are installed in a washing tank that stores water can also be employed. Also, in the method of the present invention, without using the pulsator 5

in the above-mentioned application example, the washing effect of the present invention can also be exerted simply by transmitting electricity to the electrodes 11 and applying electrolysis.

[0017]

Next, an application example for confirming the effects of the present invention will be explained. In experiments, a commercial washing machine equipped with a resin washing tank 3 in which the electrodes 11 were installed as shown in Figure 8(a) and a washing machine in which no electrodes were installed as shown in Figure 8(b) were prepared. Also, two 12-V batteries for automobiles were used as the power source 14 of the electrodes 11, and batteries in which switching between 12 V and 24 V was possible were used.

[0018]

Also, as the experimental method, using a commercial detergent, the laundry was removed at the halfway point of the normal washing time indicated on the washing machine, and the laundry was spread on a transparent acrylic plate and pasted. Bubbles were removed by applying a shower from the top, and the degree of stain removal was compared with a background of white paper or black paper. Also, as the laundry S used in the experiments, items consisting of bib S<sub>1</sub> used in a restaurant by a one-year old baby as shown in Figure 9, underwear S<sub>2</sub> worn for two days by a factory worker without taking an overnight bath shown in Figure 10, and rag S<sub>3</sub> used for one day for machine tools and attached with stains such as cutting oil were respectively cut at the center, and each was washed by both washing machines.

[0019]

Effect of the invention

The experimental results showed that for the laundry washed by the washing machine to which the present invention was applied, the stain removal was good, and especially, for the bib S<sub>1</sub> in which stains were attached in the vicinity of the center with the part cut in half, it was apparent at a glance, that the stains were thoroughly removed by the washing machine to which the present invention was applied. Also, in an experiment in which the power source 14 was switched to either 12 V or 24 V, the 24-V power source was slightly better in stain removal. Thus, in the washing method or apparatus of the present invention, the washing effect is improved, compared to the conventional washing method alone, and the laundry is not damaged.

[0020]

Therefore, with the introduction of the washing method of the present invention into conventional stirring type washing machines, etc., the washing performance is improved, the washing time is shortened, and a milder stirring can be selected, so that the laundry is protected.

Brief description of the figures

Figure 1 is a perspective oblique view showing an application example in which a whirl type washing machine is used as the electric washing apparatus of the present invention.

Figure 2 is a structural oblique view showing a state in which only its electrode part is drawn.

Figure 3 is an enlarged development showing the electrode part.

Figure 4 is a structural oblique view showing another application example.

Figure 5 is the plan view thereof.

Figure 6 is a development showing another two application examples.

Figure 7 is a partially enlarged horizontal sectional view showing an application example in which protruded resin parts are installed at the inner wall of a washing tank.

Figure 8 is an illustrative diagram showing experimental apparatuses for confirming the effects of the present invention and consists of structural front views showing the combination of a commercial washing machine with installed electrodes and a washing machine in which no electrodes are installed.

Figure 9 is a front view showing experimental results when a bib is used as a laundry item used in said experiment.

Figure 10 is a front view showing experimental results when underwear is used.

Figure 11 is a front view showing experimental results when a rag is used.

Explanation of symbols

- 1 Main body of washing machine
- 2 External case
- 3 Washing tank
- 4 Dehydrating tank
- 5 Pulsator
- 6 Belt
- 7 Pulley
- 8 Water supply port
- 9 Drainage port
- 10 Drainage hose

11 Electrode  
 12 + pole  
 13 - pole  
 14 Power source  
 15 Protruded part  
 A Faucet  
 B Bubble  
 M Motor  
 S Laundry  
 S<sub>1</sub> Bib  
 S<sub>2</sub> Underwear  
 S<sub>3</sub> Rag

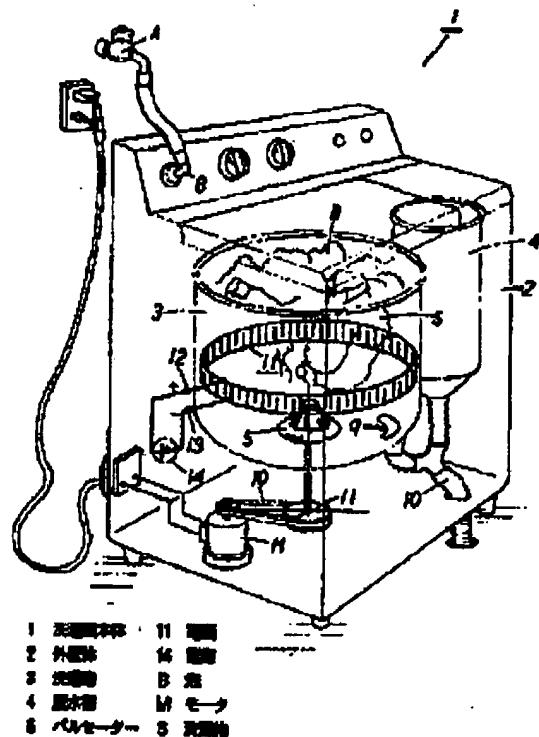


Figure 1

Key: 1 Main body of washing machine  
 2 External case  
 3 Washing tank

- 4 Dehydrating tank
- 5 Pulsator
- 11 Electrode
- 14 Power source
- B Bubble
- M Motor
- S Laundry

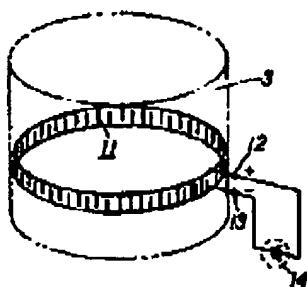


Figure 2

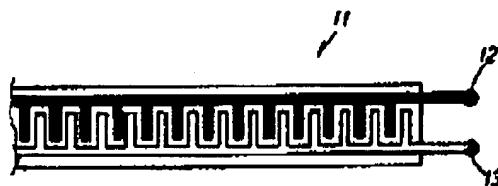


Figure 3

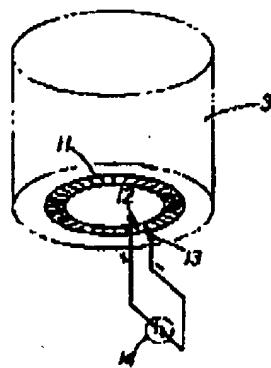


Figure 4

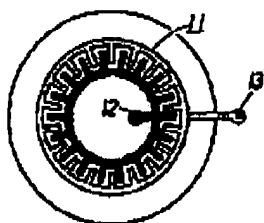


Figure 5

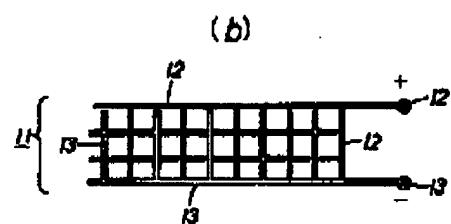
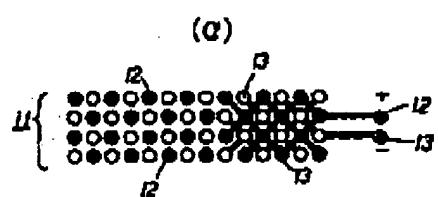


Figure 6

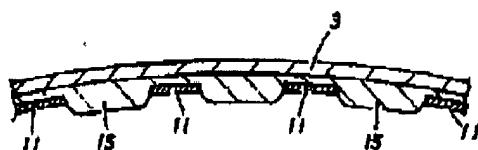


Figure 7

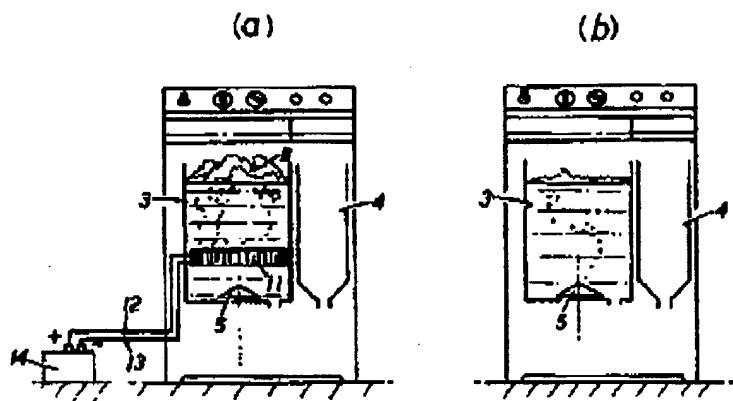


Figure 8

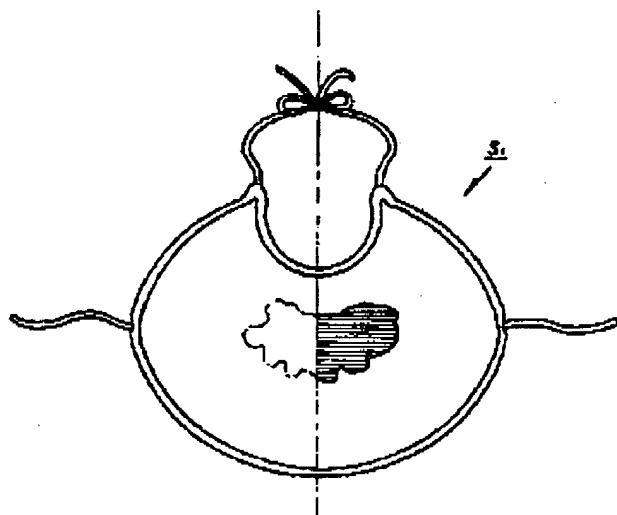


Figure 9

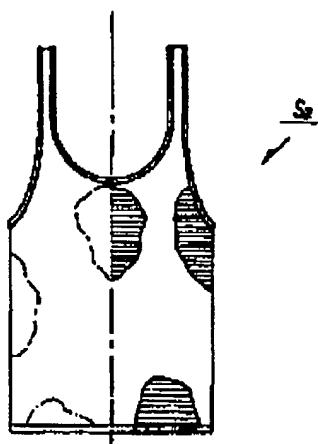


Figure 10

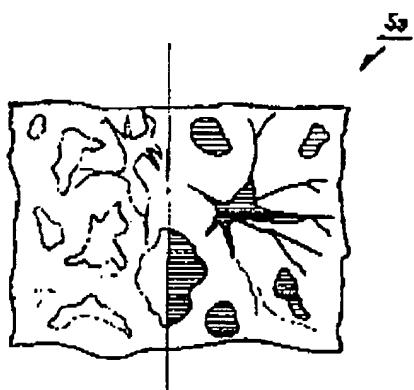


Figure 11